TABLE 3-1
KEY REMEDY ELEMENT CONSIDERATIONS
LEHIGH CEMENT COMPANY CLOSED CKD PILE SITE
METALINE FALLS, WASHINGTON

ELEMENT	KEY FUNCTION(S)	CONSIDERATIONS
Site Preparation	Prepare the site for construction and put in place site controls.	• Stormwater and erosion controls will be installed prior to disturbing soil. • Sullivan Creek is relatively close to the working area. • State Route 31 traffic will need to be monitored.
Building Expansion	Increase the space available to store carbon dioxide and other items.	• The foundation will be designed of a thickness and composition to support a full carbon dioxide tank and other miscellaneous loads. • The structure surrounding the tank should be erected after the carbon dioxide tank is delivered and installed. However, large doors will be installed to facilitate future maintenance and potential tank replacement.
Carbon Dioxide Tank	Store carbon dioxide in the liquid state.	• The tank will be similar to the tank that already exists on-site. • The tank will be pre-manufactured and shipped to the Site with refrigeration, heating, and pressure relief components. • The tank capacity will be a standard manufactured size (14 tons). • Together, the capacity of the existing tank and new tank will accommodate treatment for several months. • The tank will be equipped with pressure relief devices. • The tank will be tied down to the foundation for flood contingencies.

TABLE 3-1 (CONTINUED)
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ELEMENT	KEY FUNCTION(S)	CONSIDERATIONS
Diaphragm Walls	Provide low permeability walls that are capable of resisting adjacent soil and groundwater pressures during excavation of the treatment corridor.	• The design depth, thickness, and structure will be developed to allow open excavation of the treatment corridor. The design depth will be deeper than the top of the underlying clay aquitard • Tie-backs or support struts may be needed during excavation of the treatment corridor to limit the potential for the diaphragm walls to overturn or otherwise move from their design location. • The diaphragm walls will be designed to be resistant to corrosion by the groundwater. • The connection between the diaphragm walls and groundwater barrier walls will later be fortified to reduce the potential for water seepage through the gap between the two components. • The treatment corridor may be partially excavated and installed (as opposed to fully excavated and installed in one pass). This would help reduce the load placed on the diaphragm walls while the excavation is open.
Treatment Corridor	Deliver carbon dioxide to the groundwater.	• The treatment corridor fill materials will be high permeability to facilitate movement of the large section of captured groundwater through a small section of the site. However, the treatment corridor fill materials will also be selected to allow the water to contact carbon dioxide treatment components for time sufficient to accomplish pH adjustment. • To limit the potential for untreated groundwater to pass through the treatment corridor without receiving carbon dioxide treatment, the following components may be installed in the treatment corridor: o Horizontal or vertical diffusers (i.e., baffles) to increase mixing of the water. o Gunite coating of a contoured treatment corridor floor that follows the curvature of the carbon dioxide treatment pipes to limits the potential for water to pass under the carbon dioxide treatment systems.
Carbon Dioxide Treatment System	Provide a carbon dioxide dosage to the groundwater that will reduce the pH to meet cleanup levels.	• The expected flow and groundwater quality of the untreated groundwater influent will be estimated to calculate the carbon dioxide demand flow rate to treat the groundwater. • Based on the permeability of the silicone tubing, the amount of tubing needed to deliver the carbon dioxide at pressures of approximately 5 to 40 pounds per square inch will be calculated. • Assuming that 20 silicone tubes will be encased in each HDPE pipe, the number of HDPE pipes will be estimated.
French Drain	Assist water to flow toward the treatment corridor.	• The French drain will be installed to the top of the underlying clay aquitard and will be composed of high-permeability materials. A perforated drain pipe may also be installed along the length of the French drain if design calculations indicate that such a pipe would be beneficial.

TABLE 3-1 (CONTINUED)
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Streambed Erosion Control – Treated Water Discharge Location	Allow treated groundwater to discharge to Sullivan Creek while limiting the potential for treatment zone and streambank erosion.	• The discharge location will be designed using biostructural components to the extent practical, while still maintaining a high permeability discharge channel. • The energy of Sullivan Creek flow increases as it approaches the bluff, which increases shear forces and erosion along the bank of Sullivan Creek. The discharge location will be located as far upstream of the bluff as practical where the Sullivan Creek flow has less energy.
Groundwater Barrier Walls	Provide a low-permeability layer that captures groundwater.	• The method for constructing the groundwater barrier walls will be selected based on low-permeability requirements, constructability, and cost-effectiveness. Potential methods include: o Soil-bentonite or cement-bentonite slurry barrier walls; o HPDE membranes installed along the downgradient side of the trench used to install the French drain; and o PVC sheet piles installed using vibratory methods.
Gravity Drain	Capture groundwater and route it to downgradient floodplain.	• The size, materials, and radius of the drain pipe will be selected based on: o The depth of the Closed CKD Pile (the gravity drain is to be installed under CKD); o The diameter of pipe that accommodates the groundwater flow; o A valve will be installed at the lower end of the gravity drain to close the gravity drain to flow or direct the flow; and o Available, cost-effective drilling methods.
Wetlands Mitigation Measures	Mitigate for the wetlands that are degraded during construction.	• At least a 1:1 mitigation will occur, likely in the drainage course between the sedimentation basin and Sullivan Creek. • An area of riparian restoration and enhancement will also be completed to enhance the biological function of the site and mitigate for lost vegetation due to new Remedy structures.
Site Restoration	Restore the site to its long-term state.	• The surface grading will be completed to induce stormwater flow to enter drainage courses to limit erosion. Disturbed areas will be re-vegetated.
Institutional Controls	Augment the engineering controls.	• The permanent fence will restrict access and contain warning signs. • The restrictive covenant will include restrictions on property uses.

Notes:

WAC – Washington Administrative Code

HDPE – High density polyethylene

PVC – Polyvinyl chloride